



NDCEE

National Defense Center for Energy and Environment



DoD Executive Agent

Office of the
Assistant Secretary
of the Army
(Installations and
Environment)

Demonstration of Vegetative Roofing at Army Installations

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Technology Transfer – Supporting DoD Readiness, Sustainability, and Transformation

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Presentation Highlights

- What is Vegetative Roofing?
- Demonstration approach?
- What are demonstration findings to date?

Vegetative Roof



Viking Village



Faroe Islands



New York



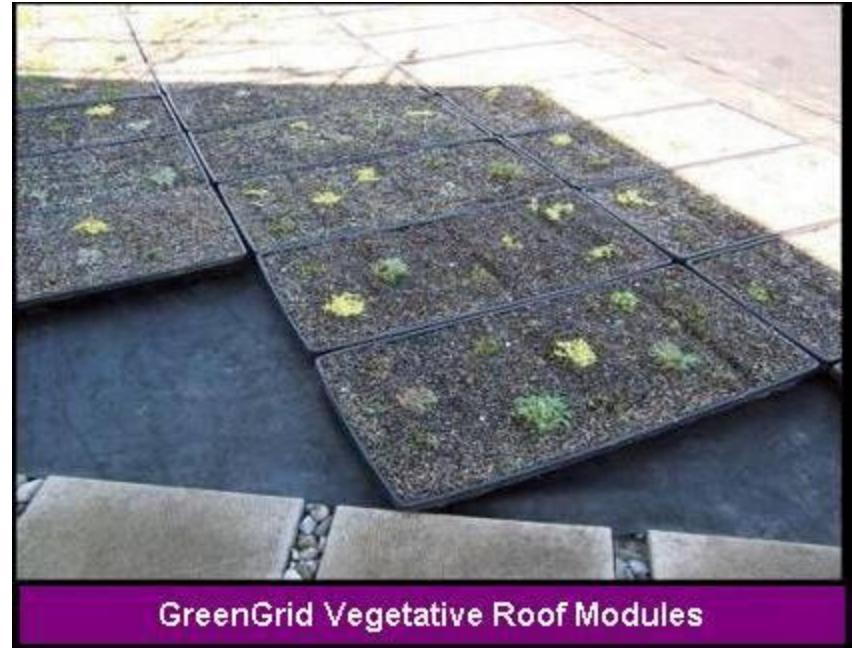
Chicago City Hall



Museum in France

Background

- Objective: Demonstrate and validate vegetative roof technology at Tobyhanna Army Depot
- Department of Army Green Building Requirements
 - FY08 LEED Silver Standard
- DoD Trends
 - Energy efficiency
 - Green building
- Green Roof
 - Sustainable technology
 - Enhance visual character
- Installation Challenges
 - Stormwater runoff
 - Energy efficiency



Technical Approach

- Monitoring System
 - Thermocouples
 - Energy Consumption
 - Temperature Differential
 - Vertical Flow Meters
 - Runoff Quantity
 - Grab Samples
 - Runoff Quality



Thermocouple Array

Technical Approach (cont'd)

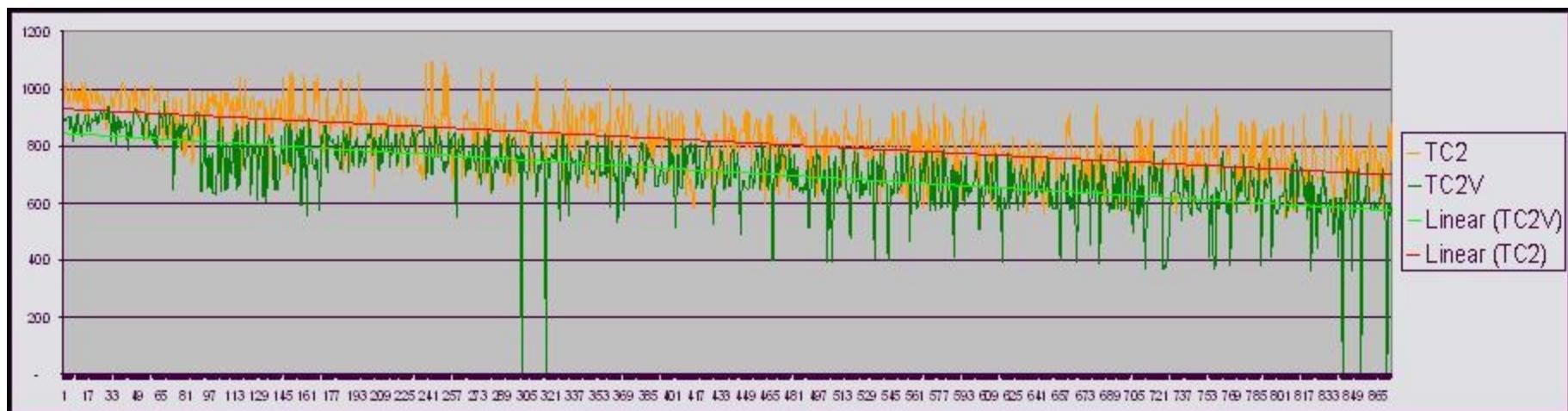
- Modular System
 - Easy maintenance
 - Adaptable (e.g., equipment installation)
 - 14,007 ft²
- Net Increase of 4 lbs/ft²
 - Rock Ballast removed- 8 lbs/ ft²
 - Roof Modules- 12 lbs/ft² fully saturated
- 64 Species of Plants
 - Mostly Sedum
 - Some Alpine Species



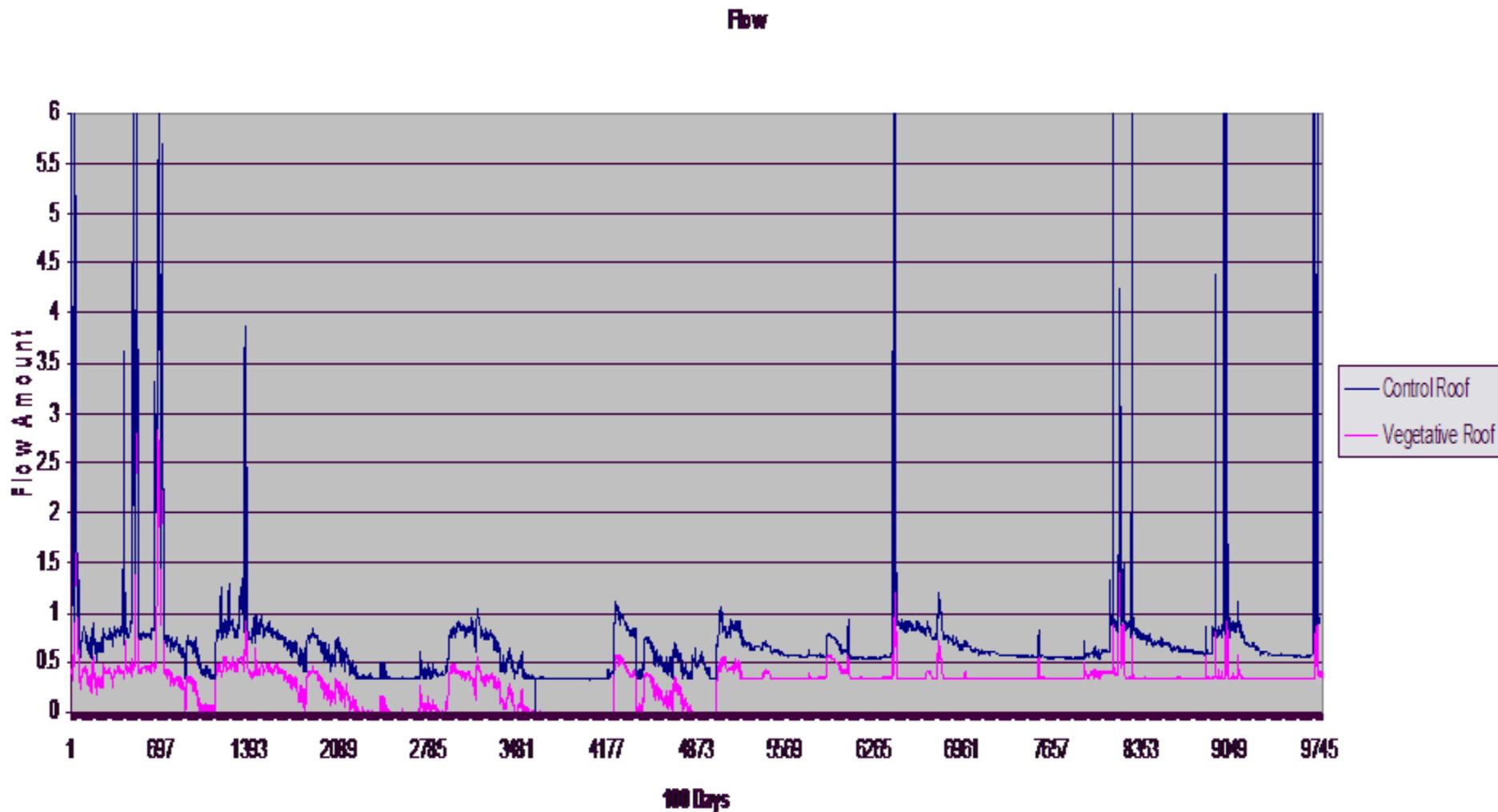
Sedum rubrotinctum

Energy Results

- Urban Heat Island Effect
 - Average 10°F cooler (ambient temperature above 50°F)
 - Average 2°F warmer (ambient temperature below 50°F)
- Energy Savings
 - Projected 40% energy savings based on tons of air conditioning saved



Water Quantity Results



- 10% Reduction in Flow
- 6500 Gallon Reduction

Water Quality Results

- Components Sampled
 - Nitrogen, Phosphates, TOC, TDS and pH
- Vegetative Roof
 - Decrease in quality
 - Due to initial fertilizer use
 - Increase in quality over time
 - With organic fertilizer



Plant Growth August 2006



Plant Growth April 2007



Plant Growth May 2007



Plant Growth July 2007



Plant Growth August 2007



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